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DISTURBANCES WITH S. C.

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by Maurice Bertrand

ABSTRACT

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Examination of long-wave atmospheric registrations obtained during the IGY shows that the sudden strengthenings produced by ionospheric disturbances with sudden commencement are not solely observed in the illuminated hemisphere and are sometimes very distinct in nighttime.

COVER-TO-COVER TRANSLATION

It is well known that: "Radioelectric waves of frequency near 30 cps (10 000 m) are particularly sensitive to ionospheric disturbances with sudden commencement, which they translate by sudden strengthenings, while short waves reveal them by sudden fadings [1]."

These strengthenings were generally ascribed to the improvement of ionosphere reflection factor under the effect of Sun's ultraviolet radiation during chromospheric flares. Thus, they should in principle manifest themselves only over the propagation trajectories traversing the illuminated hemisphere.

* Effets nocturnes sur les ondes longues des perturbations ionosphériques a début brusque.

However, R. Bureau [2] noted in a statistical study relative to the 1928 — 1941 period 18 cases of ionospheric disturbances with sudden commencement clearly registered after sunset or before sunrise.

Examination of omnidirectional registrations of atmospherics (in the frequency of 27 kcpc) obtained during the IGY by the French network of registering devices (of the sequence rate from the mean field and from the mean level) including the stations of Bagneux, Poitiers, Rabat, Mangui, Ivato (Madagascar) and Port-aux-Français (Kerguelen archipelago), have allowed to corroborate with assurance the existence of characteristic strengthenings over trajectories partially or totally by night. They are compiled in the Table next page. When compiling that Table, we considered only the ionospheric disturbances with sudden commencement taking place distinctly during nighttime, i. e. at least one hour prior sunrise or after sunset at the ground level. On the other hand it is appropriate to bring the attention to the fact that in most of the cases these strengthenings by night are corroborated by other stations of the network, situated beyond the shadow zone and by the data published in the Solar Bulletin of the National Bureau of Standards of the U.S.A. Attention is drawn to the fact that the great majority of cases mentioned was observed at the Port-aux-Français of the Kerguelen archipelago. This may be explained by the fact that the station in question, located in an area of minimum thunderstorm occurrence, utilizes very sensitive installations and that the curve remains relatively low.

The plotting of the directions existing on the radioionograms at the moment of phenomenas permitted to localize the main seats of atmospherics and to note that in 28% of the cases the trajectory of a 27 kcpc wave is nearly totally by night. In 35% of the cases it is mixed with nighttime predomination, and finally in 37% of the cases it is mixed with diurnal predomination.

NIGHTTIME IONOSPHERIC DISTURBANCES WITH SUDDEN COMMENCEMENT DETECTED BY THE
FRENCH NETWORK OF ATMOSPHERIC RECORDERS
DURING THE IGY

Date.	Place	(1) Hours U.T.				Int. J	Int. S	Hour of sunset at ground	Interval between beginning and end of disturbance	Other stations affected by the strengthening	Stations affected by findings	Observations
		(1) Begin.	(1) Max.	(1) End	(2)							
2 août 1957...	K	14 3	14 6	14 38	1	0.34	1	12 4	1 59	BXR	(3) K BE HU MC PR WS HU PU CR K BX BE HU MC PR WS CR BX BE HU MC PR WS CR HU NE PU BX BE HU MC PR WS NE	Clear
9 " " "	K	13 45	13 48	-	1	-	1	12 12	1 33	BX		Weak
23 " " "	K	14 8	14 11	15 30	2	0.41	2	12 32	1 38	BXR		Strong. Particular shape
30 " " "	K	16 44	16 47	17 1	1	-	1	12 42	4 4	BXP		Weak
3 sept. " " "	K	14 24	14 40	15 30	3	0.84	3	12 47	1 37	BXR		Remarkable
13 " " "	K	14 20	14 30	15	2	0.33	2	13 3	1 17	BXR		Clear
9 janv. 1958...	R	6 30	6 42	7	1	-	1	7 36	1 6	K		Clear, prior to sunrise
3 avril " " "	K	14 47	15 2	15 30	1	-	1	13 1	1 46	BXR IV P DU ED MC NE PASP	BE HU MC NE PR PU WS	-
4 " " "	K	14 15	14 29	15 10	1	-	1	13	1 15	BX (Rien à l'étranger)	Rien à l'étranger	Clear
3 mai " " "	K	13 10	13 44	15	3	1	3	12 6	1 4	BXR IV P DU ED KUMC NE HU BX RBO ED HU KUNEPASP BXP BO PA	BX BE HU MC NE PR BX BE HU MC NE PR TO WS CW HU MC PR	-
3 juin " " "	K	15 12	15 22	15 35	1	-	1	11 27	3 45			Weak
13 sept. " " "	K	14 20	14 30	-	1	-	1	13 2	1 18			Anomalous shape
18 " " "	{ B P }	4 1 4 4	4 8 -	5 -	1 >2	0.33 -	1 >2	5 32 5 44	1 30 1 44	IV K (Rien à l'étranger) (nothing abroad)	OK BX	Prior to sunrise
9 déc. " " "	K	18 19	18 21	18 50	2	-	2	15 12	3 7	IV (Rien à l'étranger)	BE MC PR WS BX	Remarkable

(2) Int. J. : estimated by utilizing an arbitrary scale 1 to 9; Int. S. : strengthening intensity determined by the Coorway method : C.R. p.432. 1961

(3) BE, Fort Belvoir (U. S. A.); BO, Boulder (U. S. A.); BX, Bagnaux (France); CR, New York (U. S. A.); CW, Stations anglaises; DA, Darmstadt (Allemagne); DU, Dunsink (Irlande); ED, Edinbourg (Grande-Bretagne); HU, Huancayo (Pérou); HH, Berlin (Allemagne); IV, Ivato (Madagascar); K, Port-aux-Français (Kerguelen); KU, Kuhlungsborn (Allemagne); MA, Madrid (Espagne); MC, Mac Math (U. S. A.); NE, Nederhorst den Berg (Pays-Bas); NU, Neutrelitz (Allemagne); OK, Okinawa (Pacifique); P, Poitiers (France); PA, Paramaribo (Nouvelle-Guinée); PR, Porto Rico (Antilles); PU, Prague (Tchécoslovaquie); R, Rabat (Maroc); RCA, Fort Reyes (U. S. A.); SP, Sacramento Peak (U. S. A.); SW, Enkoping (Suède); TO, Hiraio (Japon); WS, White Sands (U. S. A.).

Let us mention that our radiogoniometers have no parasitic lobes, the existence of such an anomaly (in case of maladjustments) being clearly expressed (false focuses shifted by 180° relative to the real ones) cannot escape the attention of an experienced observer, so that the propagation along the arc of a great circle opposite to the one indicated by the device seems to be excluded. Ionosphere soundings carried out by several stations situated in the vicinity of trajectories entirely by night did not reveal ionospheric anomalies, except on September 13, 1958, when a rather high absorption was noted at Hobart.

Thus it seems interesting to find out what mechanism is instrumental in producing these strengthenings over trajectories protected from direct solar radiation (sporadic E-layer, abnormal electron density gradients, etc.). Let us recall finally, that at times a fissure in the night curve may be encountered at the moment of a characteristic strengthening taking place in the illuminated hemisphere [3].

***** THE END *****

(C.N.E.T.)
Bagneux, Seine.

REFERENCES

- [1]. R. BUREAU., Comptes-Rendus, 206, p.360, 1938.
- [2]. Preliminary Note by National Laboratory of Radioelectricity: (No.14) : "Statistique des perturbations ionosphériques à début brusque au cours d'un cycle solaire 1928 à 1941." - For lack of an installation comparable with that of Kerguelen, the author could not irrefutably establish the existence of nighttime strengthenings.
- [3] R. BUREAU et M. BERTRAND, Comptes-Rendus, 242, p.2025, 1956.

Translated by ANDRE L. BRICHANT
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